ITEM: 683.10220008 – VIDEO ANALYTIC HD IP CAMERA ASSEMBLY - DOME TYPE

DESCRIPTION:

This specification shall consist of furnishing and installing HD IP Camera Assemblies at the locations shown in the plans and as directed by the Engineer. These Camera assemblies shall contain all of the accessories, cables, components, software/licenses and support documents described in the material specification and shall be configured as indicated on the contract documents.

The HD IP Camera Assemblies shall have full HD 1080p30 image resolution with an integral 30x optical zoom lens. The camera operation shall include true day-night with variable speed pan and tilt technology with a minimum sensitivity of 0.025 lux @ 30 IRE. The HD IP Camera Assemblies shall provide three or more independent output video streams configurable for H.264, H.265 and MJPEG outputs. The HD IP camera shall have video analytic capability that shall be demonstrated and tested prior to acceptance by the regional TMC.

MATERIALS:

All materials furnished, assembled, fabricated, or installed shall be new, corrosion resistant, and in strict accordance with the standards set by the New York State Department of Transportation (NYSDOT). Each of the HD IP CCTV Camera Assembly types shall deliver high quality full-motion video during day or night operation with the video and control/status data transmitted over a communications network.

The HD IP Camera Assembly shall contain the Camera optics, Sensor, H.265/H.264/MJPEG Encoder, and Pan/Tilt/Zoom motor as an integrated unit. External connections to the camera shall include Ethernet (PoE) for digital video and IP based controls. An alternative 24 VAC power supply shall also be included.

The HD IP Camera shall contain the embedded hardware and software for video analytics. The video analytic functionality shall include but shall not be limited to: Motion detection, Vehicle counting, capability of Vehicle tracking, Vehicle wrong way detection etc.

Each type of CCTV Camera Assembly shall consist of a solid state color/monochrome CCTV camera with infra-red cut filter, motorized zoom lens, pressurized enclosure, pan/tilt unit, integral camera control receiver, and all cabling required to interface the HD IP CCTV Camera Assembly with equipment in the field cabinet and CCTV pole including the Lowering devices as specified the contract document.

The HD IP CCTV Camera mounting hardware shall be suitable for mounting on poles or walls as shown in the plans and as directed by the Engineer. Connections between the equipment shall be through water proof connectors. The connectors and cables shall be reviewed and approved by the regional TMC prior to furnishing. The Connector and cables shall be submitted as part HD IP Camera Assembly Submittal minimum 30 day prior the equipment purchasing.

Repair, replacement, and parts service for the HD IP CCTV Camera Assembly shall be available within the contiguous United States or Canada. The CCTV Camera Assemblies shall be compliant with the latest version of the NTCIP Standards, as defined by AASHTO, ITE, and NEMA. All non – NTCIP protocols that may require for the camera operation, shall be provided with complete support information and details, which will be able to be integrated into the Regional TMC ATMS software.

The assembly shall include "pre-set" capability, which shall allow the camera to be automatically commanded to a predefined position via the camera control software supplied under this specification. The Contractor shall provide a totally operational assembly with all cabling and terminations matched to support the selected components.

HD IP Camera Requirements:

The Barrel Type HD IP CCTV Camera Assembly and Dome Type HD IP CCTV Camera Assemblies shall meet the following minimum requirements:

a. General:

- Weight:
  - Dome 16 pounds (max)
- Dimensions
  - Dome 12.25 (w) x 14 inches (h) (max)
- Temperature Range: -30 degrees F to +122 degrees F (operating)
- Humidity: 0 – 90% relative humidity
- Wind: Meets all performance criteria when subjected to a 75 mph wind and able to withstand a 125 mph wind gust.
- Holding Torque: Maintains current position in winds of 75 MPH or higher with TS2 vibration conditions. Operates and moves to any position in winds of 75 MPH or higher at worst case orientation to the wind.
- Power Feed: PoE+ shall be provided as part of this item and mounted in the equipment cabinet. The Cabinet is provided as part of another pay item.
- Alternative Power Feed: If the camera manufacturer does not support POE+, 24 VAC or 24 VDC (minimum 120 VA) outdoor rated Power supply, cables and mounting supports shall be provided. The Power supply shall comply with HD IP Camera manufacture requirement and shall meet NEMA 4 X and IP66 standards. Alternative power supply shall be accepted by the regional TMC.
- Power Consumption:
  - 37 W (max)
  - Typical operation less than 25 W
- Network and Electrical Interfaces
  - Outdoor Rated Cat. 6 Cable
  - Alternate Power and control cables between the CCTV Camera Assembly and the associated field cabinet shall be in accordance with the manufacturer's recommendations. As part of the Camera Assembly submittal, shop drawings showing the configuration of the harness along with the manufacturer's recommendations shall be submitted to the Engineer for approval 30 days prior to fabrication. Alternative power supply shall be accepted by the regional TMC.
  - Electrical connections between the positioning device and camera/lens shall be through a pre-wired feed-through rather than through a wiring harness.
- Enclosure:
  - Dome IP67, IP66 Rating
  - Enclosure. All hardware shall be stainless steel.
  - The manufacture certificate of rating compliance or testing result shall be submitted as requested by the Engineer.

- Display Text Labels:
  - Label text shall be positioned such that they do not interfere with the view.
  - Labels text shall be able to be disabled as necessary.
  - Label Information: Camera ID 20 alphanumeric characters (min)
  - Label Information: Preset ID
  - Label Information: Low/High Temperature (preferred option)
  - Label Information: Low/High Pressure (preferred option)

b. Camera:

- Image Sensor: ½ or 1/2.8" CMOS sensor
- Resolution 1,920 x 1,080 or better
- Frame Rate 30 fps
- Camera Format Day/Night (IR Cut Filter)
- Day/Night Modes Auto, Color, B/W
- Color Sensitivity at 33 ms and f1.4: 0.4 lux (0.04 fc) or better
- B/W Sensitivity at 33 ms and f1.6: 0.04 lux (0.004 fc) or better
- Color Sensitivity at 500 ms and f1.4: 0.025 lux (0.0025 fc) or better
- B/W Sensitivity at 500 ms and f1.6: 0.0025 lux (0.00025fc) or better
- Zoom Lens: 30x (Minimum)
- Typical Aperture: f1.4 -> f4.6 or f1.4-> f4.8
- Horizontal Angle of View: Minimum 63.4° to 2.3°
- Focus: Auto/Manual (Near, Far)
- Focus Search: Normal, Bright, Point Source
- Focus Sensitivity: Low, Normal, High
- Iris: Auto/Manual (Open/Close)
- Digital Zoom: 12x, Off/On (Depth)
- A Defog Mode Function/ Analytics: Off/Auto with user configuration setting/Manual with defog and haze enhancement Levels,
- Image Stabilization Mode Function: Off/On Level adjustment
- Enhanced Intensity Function: Off, Enhanced, Whiteout Reduction Level adjustment
- Dynamic Range Function: Greater than 90dB in Normal/Combo/Contrast Level adjustment
- Back Light Comp Function: Off/On Level Setting
- Auto Electronic Shutter (AES): Auto/Manual, range 1/2 -> 1/30,000 or as approved by the Engineer
- Slow Shutter Off/On, range 1/15->1/2 or as approved by the Engineer
- IR Correction: Off/On [850nm]
- White Balance: Auto/Manual
- (WB) Modes Normal, Mercury, Sodium Vapor
- Automated Gain Control (AGC): Adjustable 1 to 48db or as approved by the Engineer
- Sharpness Soft, Normal, Sharp, Sharpest
- Noise Reduction: Normal, Medium, Strong, Fixed Levels

c. Camera PTZ:

- Dome Type Camera
  - Pan Range: 360° continuous rotation
  - Tilt Range: +10° to -90°
  - Manual Pan Speed: 0.1° to 45°/second
  - Manual Tilt Speed: 0.1° to 45°/second
  - Speed Resolution: Greater than 64 Variable speed levels
  - Preset Speed: 180° movement on less than 1.5 Seconds
  - Repeatability: +/- 0.1°
  - Resolution: +/- 0.1°
  - Presets: 512, Includes pan, tilt, zoom, focus, preset ID, I/O output state
  - Tours: 512, Includes presets with dwell, speed, and direction and recurrence properties
  - Auto Park: Returns to a preset or tour after timer expires,
  - Privacy Masks: Minimum 8/16 – user defined mask area
  - Firmware Updating: Via Ethernet connection

d. Video Streams:

- Video Streams: Minimum three video streams
- Video Encoding: H.265, H.264 Base, Main and High Profiles, MJPEG
- Video Protocols: RTSP/RTP, RTSP Interleave, HTTP Tunneling, RTP Multicast
- Video Resolution: 1080p, 720p, D1, CIF, QCIF
- Video Frame Rate: 1 to 30, 30 default
- Video Data Rate: 256kbps to 8Mbps
- Video Rate Control: Variable or Constant Bit Rate
- Video Latency for Four frames base: 0.133 sec. or better
- Video Transmission: 99.999% error free or better

e. Network Interfaces:

- Ethernet: 802.3u 100Base-T, MDI-X auto-sensing, full duplex
- Digital Inputs: Minimum two (2) Sensor Inputs, Dry contact, NO or NC
- Digital Outputs: Minimum two (2) Control Output, Open collector
- Protocol: TCP, UDP, IPv4, IGMP, ICMP, DNS, DHCP, RTP, RTSP, RTCP, NTP, HTTP, SOAP, HTTPS ARP, FTP, SMTP, Telnet. ONVIF Profile S
- Media Players: VLC, Quick Time, Compliant media player with RFC 2326, 3984, 3550, 2435, ISO/ IEC 13818-1
- ONVIF: Profile S
- Camera Control: NTCIP, ONVIF Profile S
- Security: Admin, Operator User, Anonymous User, Digest Authentication Levels
- Updates File: Over network using camera web server interface

f. Video Analytics

- Embedded hardware in the camera
- Function: Video Motion Detection,
- Function: Vehicle pedestrian/bicycle Counting

- Function Vehicles/ pedestrian/bicycle classification Function: Vehicle speed measurement
- Function: Vehicle Stop Detection (a preferredoption for location verification and stopping time monitoring)
- Function: Vehicle Wrong way detection and Alarming
- Function: Accident detection and Alarming
- Function: Vehicles Tracking
- Function: capability Perimeter Detection/Defender
- Function: capability of Intrusion Detection and alarming
- All necessary software licenses for operation of video analytics functions
- Capability for integration to the regional TMC video analytic central system.
- Support an application platform enabling installation of a third-party applications.

The contractor shall perform a Video Analytic functionality demonstration and evaluation testing prior submitting the HD IP camera item submittal. The contractor shall submit the demonstration procedure and requirement verification approach in advanced for review and approval. The regional TMC will participate in the demonstration. Only approved demonstration equipment/ software/ tools can be proposed for HD IP camera submittal item. project.

g. Certifications:

- FCC Class A
- CE
- RoHS
- NTCIP
- ONVIF Profile S

To ensure compatibility and interchangeability with equipment furnished in previous and future contracts, the Barrel and Dome Type HD IP CCTV Camera Assemblies shall be compliant with the latest version of the NTCIP Standards, as defined by AASHTO, ITE, and NEMA. The following conformance groups within the NTCIP 1205:2001 standard shall be supported with the values defined in these tables. For the purposes of this specification NTCIP 1205 Conformance Statements shall be considered mandatory, except where noted.

Conformance Statements

Object Or Table Name	**Reference**	**Conformance Requirement Within The Group**
Configuration	NTCIP 1201:1996	Mandatory
Database Management	NTCIP 1201:1996	Amendment 1 Optional
Time Management	NTCIP 1201:1996	Amendment 1 Optional
CCTV Configuration	NTCIP 1205	Mandatory
Extended Functions	NTCIP 1205	Mandatory
Motion Control	NTCIP 1205	Mandatory
On-Screen Menu Control	NTCIP 1205	Optional

CCTV Configuration Conformance Group

MIB	Object Or Table Name	NTCIP Reference	NYSDOT Specification Section Reference	Expected Value
3.2.1	RangeMaximumPreset	NTCIP 1205	**3.2**	32 to 255
3.2.2	rangePanLeftLimit	NTCIP 1205	3.4	35999
3.2.3	rangePanRightLimit	NTCIP 1205	3.4	35999
3.2.4	rangePanHomePosition	NTCIP 1205	**3.5**	**0**
3.2.5	trueNorthOffset	NTCIP 1205	**3.5**	**0**
3.2.6	rangeTiltUpLimit	NTCIP 1205	**3.4.1 (Positioner)**	**9000**
			3.4.2 (dome)	**1000**
3.2.7	rangeTiltDownLimit	NTCIP 1205	**3.4.1**	**27000 27000**
			3.4.2	**27000**
3.2.8	rangeZoomLimit	NTCIP 1205	**2.6**	65535
3.2.9	rangeFocusLimit	NTCIP 1205	**2.7**	65535
3.2.10	rangeIrisLimit	NTCIP 1205	**2.8**	65535
3.2.11	rangeMinimumPanStepAngle	NTCIP 1205	**3.4**	5
3.2.12	rangeMinimumTiltStepAngle	NTCIP 1205	3.4	5
3.3.1	timeoutPan	NTCIP 1205	-	0-65535
3.3.2	timeoutTilt	NTCIP 1205	-	0-65535
3.3.3	timeoutZoom	NTCIP 1205	-	0-65535
3.3.4	timeoutFocus	NTCIP 1205	-	0-65535
3.3.5	timeoutIris	NTCIP 1205	-	0-65535
3.11.1	labelMaximum	NTCIP 1205	**3.6**	9..255
3.11.2	labelTable	NTCIP 1205	**3.6**	
3.11.2	labelEntry	NTCIP 1205	**3.6**	
3.11.2.1	labelIndex	NTCIP 1205	**3.6**	0..255
3.11.2.2	labelText	NTCIP 1205	**3.6**	0..255
3.11.2.3	labelFontType	NTCIP 1205	**3.6**	1
3.11.2.4	labelHeight	NTCIP 1205	**3.6**	0..255
3.11.2.5	labelColor	NTCIP 1205	**3.6**	0
3.11.2.6	labelStartRow	NTCIP 1205	**3.6**	0..255
3.11.2.7	labelStartColumn	NTCIP 1205	**3.6**	0..255
3.11.2.8	labelStatus	NTCIP 1205	**3.6**	Bit 7 = 0,1 Bit 6 = 0,1
3.11.3	labelLocationLabel	NTCIP 1205	**3.6**	0..255
3.11.4	labelEnableTextDisplay	NTCIP 1205	**3.6**	Bit 7 = ON

Extended Functions Conformance Group

MIB	Object Or Table Name	NTCIP Reference	NYSDOT Specification Section Reference	Expected Value
3.6.1	systemCameraFeatureControl	NTCIP 1205	1.6, 3.7	Byte 1 Bit 7 = 0,1 Bit 6 = 0,1 Bit 5 = 0 Bit 4 = 0 Bit 3 = 0 Byte 2 Bit 7 = 1
3.6.2	systemCameraFeatureStatus	NTCIP 1205	1.6, 3.7	Byte 1 Bit 7 = 0 Bit 6 = 0,1 Bit 5 = 0,1 Bit 4 = 0 Bit 3 = 0
3.6.3	systemCameraEquipped	NTCIP 1205	1.6, 3.7	Bit 7 = 1 Bit 6 = 1 Bit 5 = 0 Bit 4 = 0 Bit 3 = 0
3.6.4	systemLensFeatureControl	NTCIP 1205	2.6, 2.7, 2.8	Byte 1 Bit 7 = 0,1 Bit 6 = 0,1 Byte 2 Bit 7 = 0,1
3.6.5	systemLensFeatureStatus	NTCIP 1205	2.6, 2.7, 2.8	Byte 1 Bit 7 = 0,1 Bit 6 = 0,1
3.6.6	systemLensEquipped	NTCIP 1205	2.6, 2.7, 2.8	Byte 1 Bit 7 = 1 Bit 6 = 1
3.7.1	alarmStatus	NTCIP 1205	3.3	Bit 7 = 0 Bit 6 = 0

				Bit 5 = 0 Bit 4 = 0,1 Bit 3 = 0,1 Bit 2 = 0 Bit 1 = 0
3.7.2	alarmLatchStatus	NTCIP 1205	**3.3**	Bit 7 = 0 Bit 6 = 0 Bit 5 = 0 Bit 4 = 0,1 Bit 3 = 0,1 Bit 2 = 0 Bit 1 = 0
3.7.3	alarmLatchClear	NTCIP 1205	**3.3**	Bit 7 = 0 Bit 6 = 0 Bit 5 = 0 Bit 4 = 0,1 Bit 3 = 0,1 Bit 2 = 0 Bit 1 = 0
3.7.4	alarmTemperatureHighLowThreshold	NTCIP 1205	Not Applicable	
3.7.5	alarmTemperatureCurrentValue	NTCIP 1205	Not Applicable	
3.7.6	alarmPressureHighLowThreshold	NTCIP 1205	Not Applicable	
3.7.7	alarmPressureCurrentValue	NTCIP 1205	Not Applicable	
3.7.8	alarmWasherFluidHighLowThreshold	NTCIP 1205	Not Applicable	
3.7.9	alarmWasherFluidCurrentValue	NTCIP 1205	Not Applicable	
3.7.10	alarmLabelIndex	NTCIP 1205	1.3, 1.11	Byte 1 = 0 Byte 2 = 0 Byte 3 = 0 Byte 4 = 0 Byte 5 = 0 Byte 6 = 0 Byte 7 = 0
3.8.1	inputStatus	NTCIP 1205	Not Applicable	

3.8.2	inputLatchStatus	NTCIP 1205	Not Applicable	
3.8.3	inputLatchClear	NTCIP 1205	Not Applicable	
3.8.4	inputLabelIndex	NTCIP 1205	Not Applicable	
3.9.1	outputStatus	NTCIP 1205	Not Applicable	
3.9.2	outputControl	NTCIP 1205	Not Applicable	
3.9.3	outputLabelIndex	NTCIP 1205	Not Applicable	
3.10.1	zoneMaximum	NTCIP 1205	**3.9**	0
3.10.2	zoneTable	NTCIP 1205	**3.9**	INTEGER
3.10.2.1	zoneIndex	NTCIP 1205	**3.9**	1..255
3.10.2.2	zoneLabel	NTCIP 1205	**3.9**	1..255
3.10.2.3	zonePanLeftLimit	NTCIP 1205	**3.4 , 3.9**	0..35999
3.10.2.4	zonePanRightLimit	NTCIP 1205	**3.4 , 3.9**	0..35999
3.10.2.5	zoneTiltUpLimit	NTCIP 1205	3.4.1, 3.9 3.4.2, 3.9	0..3300 0--200
3.10.2.6	zoneTiltDownLimit	NTCIP 1205	3.4.1, 3.9 3.4.2, 3.9	0..26300 0..27000

Motion Control Conformance Group

MIB	**Object Or Table Name**	**NTCIP Reference**	**NYSDOT Specification Section Reference**	**Expected Value**
3.10.1	zoneMaximum	NTCIP 1205	Not Applicable	
3.4.1	presetGotoPosition	NTCIP 1205	3.2	0..n
3.4.2	presetStorePosition	NTCIP 1205	3.2	0..n
3.5.1	positionPan	NTCIP 1205	3.4	4 Byte msg
3.5.2	positionTilt	NTCIP 1205	3.4	4 Byte msg
3.5.3	positionZoomLens	NTCIP 1205	3.4	4 Byte msg

3.5.4	positionFocusLens	NTCIP 1205	3.4	4 Byte msg
3.5.5	positionIrisLens	NTCIP 1205	3.4	4 Byte msg – Only support continuous iris movement

n = number of presets supported by the CCTV Camera Assembly

HD IP Camera Assembly Requirements:

Provisions shall be made in the HD IP Camera Assembly for the installation of all accessories, cables, connectors, mounting hardware and equipment required for the full operation of the CCTV camera. The following equipment cabling shall be provided under other contract items:

a. Surge Protectors: All outputs/inputs cables from the camera including Ethernet cable, power cable and data shall be protected by individual surge protector. The surge protectors shall be same or equal as:
   - Emerson Edco-Cat6-POE
   - Emerson Edco-CX06-MI
   - Emerson Edco-PC642
   - Emerson Edco-PHC

b. Power Injector or 24 VAC Power Supply: The contractor shall furnish and install the Power Injector or power supply unit as per the regional TMC. The Power Injector or power supply shall comply with the camera manufacturer's requirements and shall be a ruggedized unit.

c. Video Monitoring and PTZ control and Video Analytics Software: The contractor shall furnish and install the video monitoring, camera control and the video analytics software as per camera manufacture recommendations and the Regional TMC integration requirement guidelines. The Contractor shall furnish and install all necessary licenses for full software operation and testing. All software shall be the latest version from the vendor with expiration date beyond the project closeout date.

d. Camera Cabling: The Contractor shall furnish all Input/output cables from the HD IP camera to the field equipment cabinet. These cables shall include, Ethernet, Power, Grounding, Video, Data, Control and I/O signal. The Cables shall be outdoor rated applicable for vertical installation. The Contractor's cabling submittal shall include the camera cables with Camera Pole Lowering device connectors, if such lowering device is applicable to the project

e. Camera Equipment and Cable Labels: The Contractor shall submit the complete label information of all HD IP Camera equipment and cable labels. The labeling shall comply with the Regional Transportation Management Center (TMC) labeling format and standard requirements. All label materials shall be industry rated with minimum 10 years lifetime. The contractor may request a copy of the Regional TMC labeling format and standard.

f. Camera Alarm Interface/Contacts: The Camera Alarm signal shall be connected to the Field Equipment cabinet. The Contractor shall furnish terminals and relays for connection to the cabinet's Non-IP Alarm monitoring Unit. The Non-IP Alarm Monitoring Unit will be paid under a separate pay item.

g. Workmanship - Workmanship shall conform to the requirements of this specification and be in accordance with the highest industry standards.

h. All incidental parts necessary to complete the installation but not specified herein or on the plans shall be provided as necessary to provide a complete and properly operating system.

i. Manufacturer's extended warranty: The contractor shall transfer the HD IP Camera manufacture warranty service for a period of thirty-six (36) months from the delivery date of the system under normal use and service

The Contractor shall submit a detailed dimensional drawing and the HD IP Camera equipment general layout of each type of components used in the camera assembly with data sheet or cut sheet submittal for review by the Regional TMC Engineer. Only HD IP Camera Assembly items with approve. Layouts will be accepted under this Contract.

Video Analytics functionality and capability shall be demonstrated for the Regional TMC. The demonstration shall include a live testing of camera analytics and shall include the demonstration testing plan, check list and approval criteria. The contractor shall coordinate with the regional TMC for requirements and approval criteria development.

After HD IP Camera equipment general layout and components approval contractor shall submit the detail schematic drawing for review by the regional TMC engineer.

CONSTRUCTION DETAILS:

The Contractor shall coordinate the schedule of all ITS construction work including equipment procurement and furnishing, pole manufacturing, foundations, conduit and cabling, installation, inspection and testing with Regional TMC.

The HD IP Camera Assembly shall be installed on a designated CCTV pole or structure as shown on the plans along with conduit fittings necessary to bring cables from the camera to the designated field equipment cabinet. Each HD IP Camera Assembly shall be installed such that the line of sight of the camera is in the center line of the desired field of view when the camera is in the midpoint of the desired motion between the limit stops. The Contractor shall coordinate the orientation of the camera lowering device arms or bracketing with the Regional TMC.

Each HD IP Camera Assembly shall be installed such that the home position for each camera shall be set to true North. The Regional TMC Engineer will provide the field of view of each camera, the limit settings of its vertical and horizontal movements and the programmable parameters prior to installation. The Contractor shall configure and program the Camera as per Regional TMC field of view and recommendations. The Contractor shall furnish and install the mounting hardware, including brackets, mounting plates, bolts, connectors, cabling between the camera housing and equipment cabinet, and weather heads required for the installation of the HD IP Camera Assembly. The Contractor shall install and connect the camera cables between the HD IP Camera Assembly and the equipment cabinet in accordance with the manufacturer's recommendation.

The Contractor shall program and configure the HD IP Camera with a minimum of two digital view streams. The Video streams shall have maximum and minimum transmission bandwidths. The High-quality video shall be designated to the Regional TMC and low-quality video for other applications. The Video streams shall have a default setting as:

- High Resolution Video Steam: 1080P, 4 Mbps Bandwidth, 30 Frames per Second,
- Low Resolution Video Steam: CIF, 64 kbps Bandwidth and 5 Frames per Second

The Contractor shall send the list of the camera's parameters and the proposed values to the Regional TMC for review and approval. The above video steam setting parameters shall be confirmed with the Regional TMC based on the communication service per camera location.

Per Regional TMC direction the Contractor shall program the Camera presets and the camera display labels. The contractor shall coordinate with the Regional TMC regarding the video quality and maximum and minimum bandwidth requirement. The contractor shall document all configuration and programming of the camera and the document shall be submitted to the Regional TMC with As-Built submittal package.

HD IP Camera Assembly Final Test:

Each HD IP Camera Assembly shall have a field inspection and testing under witness of the Regional TMC Engineer. The contractor shall provide the HD IP Camera Assembly testing plan and check list with following items:

1. HD IP Camera unit (Model, Manufacturer, MAC Address, Serial Number Checks)
2. Camera Mounting Check
3. Camera assembly on the Lowering Device Check (If Lowering device used)
4. Camera Cable connections at the Field equipment Cabinet Check
5. Camera Cable Labels and Installation Check
6. Camera Surge Protector (SP) installation and function test (Test as per SP manufacturer's recommendation)
7. Camera Cable Tests via Cable Tester
8. Camera Connections to Power and Network Check
9. Camera Setting and Configuration Test:
    a- IP Addressing (IP addresses, Ports, VLAN, Multicasting Checks)
    b- High Quality Video Stream (Visual test, Video Latency, Bandwidth, Frame Rate, S/N, Error Rate, Zoom (1-30x), Focus (Manual-Auto), and image stabilization Checks)
    c- Low resolution Video Stream (Visual test, Video Latency, Bandwidth, Frame Rate, S/N, Error Rate, Zoom (1-30x), Focus (Manual-Auto), and image stabilization Checks)
    d- PTZ Control Test via Ethernet Port (Pan (1-Max), Tele (1-Max), Movement Latency (less than 1.5 Sec for 360 degree Checks))
    e- PTZ Control Test via Serial Data Port- If applicable (Pan (1-Max), Tele (1-Max), Movement Latency (less than 1.5 Sec for 360 degree Checks)
    f- PTZ Control Test including NTCIP Protocol (NTCIP detail check list test shall be submitted and the test shall be performed)
    g- Video Related Protocol Test
    h- Data Protocol Test
    i- Analog Video Quality Check- If applicable
    j- Home Parking Preset Test

k- Presets Programming and Test (minimum 8 Presets Check)
l- Tours Programming and Test (minimum 8 Tours Check)

10. Camera Control/Monitor Software Test (Software to be installed in NYSDOT Field Technician Notebook)
11. Camera Power Source Check
12. Camera Power Injector or Supply Voltage measurement
13. Camera Ground Resistant Measurement Check (Test may perform during the installation and the data has been documented here. The ground reading measurement shall comply with NYSDOT standard and NEC Article 250)
14. HD IP Camera Equipment at the Field Cabinet Grounding Check
15. HD IP Camera Equipment at the Field Cabinet mounting (safety and secure installation) Check
16. Camera Equipment Labeling (format and material)
17. Camera cables and wiring Labeling (format and material)
18. HD IP Camera Assembly Layout Drawing Check
19. HD IP Camera Assembly Internal Wiring Diagram Drawing Check
20. Camera Equipment and Cables Check list

The contractor shall prepare the above test procedures and check lists and submit to the regional TMC for review a minimum of 60-Days prior to test schedules.

All Operation, monitoring and control tests shall be completed in a local mode (Stand-Alone Test Action at each field location with no network connectivity), Remote mode (remote access to the site via network with HD IP camera software) and Central mode test (Test via the Regional TMC existing video management system). The Integration of the HD IP Camera to the existing the Regional TMC video management system will be performed by the Regional TMC and an Ethernet Ping testing will be performed by Regional TMC to confirm the field HD IP camera is integrated to the network.. The contractor shall coordinate this integration with the Regional TMC.

Documentation:

Two submittals of the HD IP Camera Assembly Drawing Package shall be sent to the Regional TMC for review and approval. These submittals are:

- **HD IP Camera Assembly Shop Drawing Submittal**

  The contractor shall submit the HD IP Camera Assembly proposed shop drawings and details to the Regional TMC for review and approval 30 days prior the equipment purchasing, wiring and equipment assembly date. The Contractor shall consider a minimum of 15 days for the Regional TMC review period. The HD IP Camera Assembly proposed shop drawings shall include the following but not be limited to:

  - IP Camera Assembly Equipment Manufacturer's Cut Sheets (Cut sheets of each type of component used in the camera assembly shall be included)
  - Camera Assembly Layout (all physical dimensions and assembly details for each type of component used in the camera assembly shall be included)
  - Camera mounting details (including lowering device, if applicable, mounting details and all mounting hardware details)

- Camera Assembly Equipment at the Field Equipment Cabinet Placement. Placement (locations for the camera equipment and components within the cabinet rack and shelves)
- Camera Assembly Power, Communication/Network and Control Diagrams (all AC power, assigned CB and power wires shall be included)
- Camera Assembly Communication/Network, control wiring Diagrams (all equipment connections and interfaces shall be included). This drawing shall provide the details of the HD IP camera physical connection to the Regional TMC.
- Camera Assembly equipment, cables and wiring labeling details.
- Camera Equipment in Field Cabinet
- The contractor shall include the HD IP camera configuration details including list of parameters, parameters values and any information regarding the camera setting. Any default or non-used parameters shall be described in this submittal.

The Contractor shall respond to the HD IP Camera Assembly Shop Drawing Submittal comments and resubmit this package to the Regional TMC for review and approval. No equipment shall be purchased and no wiring shall be made before the HD IP Camera Assembly Shop Drawing Submittal approval from the Regional TMC. Each RHD IP Camera Assembly Shop Drawing resubmission package shall be sent to the Regional TMC minimum 20 days before the equipment purchasing, wiring and equipment assembly date. The Contractor shall consider minimum 7 days for the Regional TMC review period on each resubmission package. The Contractor shall be responsible for any delay regarding the package resubmission and approval process.

- **Final HD IP Camera Assembly Drawing Package:**

The HD IP Camera Assembly Drawing Package shall be approved by the Regional TMC prior to final acceptance of HD IP Camera Assembly. The HD IP Camera Assembly drawings package shall include but not limited to:

a) HD IP Camera Assembly Layout As-Built, The contractor shall submit the complete set of shop and As-built drawings of the HD IP Camera Assembly for each camera construction site. These drawings shall include but not be limited to, camera pole or structure, power and communication pull box types and locations, conduits and cables type and routing layouts for each construction camera site as per contract documents. This Record Drawings shall include location of Pole, cabinet, camera and its equipment and wiring as per construction.

b) HD IP Camera Equipment Layouts As-Builts, (all physical dimensions and assembly details shall be included)

c) HD IP Camera Manufacturer's Data: Submit manufacturer's data sheets indicating camera systems and components proposed for use, including instruction manuals.

d) HD IP Camera Mounting Details As-Builts, Camera mounting details shop drawing (including foundation, cabinet base details and pole mounting details). The shop drawing shall include the details of mounting, physical mounting hardware details, connectors and all terminations of the wires.)

e) HD IP camera equipment Placement As-Builts,(locations for the camera equipment and components within the cabinet rack and shelves)

f) HD IP Camera Assembly Power and Communication/Network and control wiring Diagram As-Builts (all equipment connections and interfaces shall be included). The contractor submittal shall have complete shop drawings including connection diagrams for interfacing equipment, list of connected equipment.

g) HD IP camera connection to the Regional TMC As-Built

This Communication/Network As-Built shall have all physical connectivity details including the communication cables, access, services or control wiring Diagrams from HD IP camera at field to the Regional TMC. If a Communication Data service will be used, the details of the service shall be provided with account service transition to the Regional TMC (if applicable). The physical Network diagrams shall show all equipment connections and interface equipment/module details.

h) HD IP Camera Assembly Test Plan and Test Results (Submit results of field testing of every device including date, testing personnel, retesting date if applicable, and confirmation that every device passed field testing.)

i) The contractor shall include the final HD IP camera configuration details including list of parameters, parameters values and any information regarding the camera setting. Any default or non-used parameters shall be described in this submittal.

j) HD IP Camera Assembly equipment, cables and wiring labeling details

k) Operation and Maintenance Data: Submit manufacturer's operation and maintenance data, customized to the system installed. Include system and operator manuals.

l) Complete list of replaceable parts including names of vendors for parts not identified by universal part numbers such as JEDEC, RETMA or EIA

All HD IP Camera Assembly drawings shall be 11" x 17" size. All drawings shall be submitted in hard copy and electronic, and CAD (MicroStation) formats. The Final HD IP Camera Assembly Shop Drawing Package shall be signed by the contractor. Each HD IP Camera Assembly shall be supplied with three (3) copies of the Final approved HD IP Camera Assembly Shop Drawing Package. One (1) copy shall be placed in a clear plastic envelope to remain in the CCTV Field cabinet. Two (2) copies shall be delivered to the Engineer and the Regional TMC. The Electronic/CADD (MicroStation) copies shall be submitted to the Regional TMC. For each As-Built submittal the contractor shall provide a copy of the Engineer approval including a copy of any applicable inspection report to the regional TMC.

VIDEO ANALYTIC TRAINING

The Contractor shall provide a minimum 8 hours training course or 16 hours web base training for the HD IP Camera Video Analytic Assembly including:

- Proposed Video Analytic Concepts
- Proposed Video Analytics tools (hardware part and software modules)
- Video analytic Operation Training administration, camera analytic configuration, control, object sets, function setting, verification and testing, displaying, alarm notification and reporting

- Maintenance: Video analytic hardware and software preventive maintenance needs and procedure, Camera checking, test and diagnostic, updating, hardware Spare parts and maintenance tools.

The Training shall be performed in the Regional TMC or as alternative shall support be a Web based training (16 hours). The training shall be performed in two levelsOperator (Level one) and Admin and management (Level 2). The Training program shall issue a certification to successful trainees. The Web based training shall include 8-hours post training support.. The contractor shall provide all necessary software for the Web based training. All training material and support training tools shall be provided by the contractor. The contractor shall coordinate the training schedule and provision of materials with the Regional TMC.

WARRANTY

The Contractor shall provide warranties and guarantees to the New York State Department of Transportation in accordance with Article 104-08 of the Standard Specifications. In addition, the contractor shall provide minimum two years support from the manufacturer for the camera video analytic software/ tools.

METHOD OF MEASUREMENT:

Each HD IP Camera Assembly shall be measured as the number of complete units furnished, installed, configured, integrated, warranty and tested. The measurement also includes successful completion of the Video Analytic training and approval by the regional TMC.

BASIS OF PAYMENT:

The unit price bid for each HD IP Camera Assembly shall include the cost of furnishing all labor, materials, tools, pedestal, equipment, support, warranty, testing, training and incidentals as necessary to complete the work.

Progress payments will be made as follows:

Twenty Five percent (25%) of the bid price of each item will be paid upon satisfactory completion and approval of the HD IP Camera Assembly Submittal.

Sixty percent (60%) will be paid upon satisfactory completion of the HD IP Camera Assembly Test. The video analytic functions shall be tested and approved by the regional TMC.

Fifteen percent (15%) will be paid upon satisfactory completion of 90-Day Operational Test of the HD IP Camera Assembly and receipt of all As-builts by the regional TMC.